

## CLAIMS

1. A control system for a vehicle, comprising:  
at least one input device which is operatively connected to a first sensor, a  
second sensor and a third sensor for sensing an input to said input  
device and providing in response thereto a first unprocessed sensor  
5 signal, a second unprocessed sensor signal and a third unprocessed  
sensor signal;  
an input device module which is adapted to receive the first unprocessed  
sensor signal, the second unprocessed sensor signal and the third  
unprocessed sensor signal and provide a processed sensor signal  
10 output;  
a first controller which is adapted to receive the first unprocessed sensor signal  
and the processed sensor signal;  
a second controller which is adapted to receive the second unprocessed sensor  
signal and the processed sensor signal;  
15 a third controller which is adapted to receive the third unprocessed sensor  
signal and the processed sensor signal, and  
a controller bus which is operatively connected to each of said first controller,  
said second controller and said third controller and adapted to  
provide signal communication between each of them.

2. The control system of claim 1, wherein each of said first  
controller, second controller and third controller is adapted to compare the  
processed sensor signal and the unprocessed sensor signal which it has  
received to determine a first signal differential, a second signal differential and  
5 a third signal differential, respectively.

3. The control system of claim 2, wherein each of said first  
controller, second controller and third controller is adapted to compare the  
respective first signal differential, second signal differential and third signal

differential to a predetermined differential threshold, and wherein if the  
5 absolute value of either of the first signal differential, second signal  
differential and third signal differential is greater than the predetermined  
differential threshold, said first controller, second controller and third  
controller are adapted to determine a resolved sensor signal for use by each of  
them using the unprocessed sensor signals and the processed sensor signals,  
10 and wherein if the absolute value of the first signal differential, second signal  
differential and third signal differential is less than or equal to the  
predetermined differential threshold, each of said first controller, second  
controller and third controller is adapted to use the processed sensor signal.

4. The control system of claim 3, wherein said first controller,  
second controller and third controller are adapted to determine a resolved  
sensor signal using a voting process therebetween.

5. The control system of claim 3, wherein said input device is an  
accelerator actuator and the first sensor, second sensor and third sensor are  
each an accelerator actuator sensor.

6. The control system of claim 3, wherein said input device is a  
brake actuator and the first sensor, second sensor and third sensor are each a  
brake actuator sensor.

7. The control system of claim 3, wherein said input device is a  
steering actuator and the first sensor, second sensor and third sensor are each a  
steering actuator sensor.

8. The control system of claim 1, wherein said input device  
module is also adapted to provide a sensor status signal output, and wherein  
each of said first controller, second controller and third controller is adapted to  
receive the sensor status signal.

9. The control system of claim 8, wherein each of said first controller, second controller and third controller is adapted to compare the processed sensor signal and the unprocessed sensor signal which it has received to determine a first signal differential, a second signal differential and  
 5 a third signal differential, respectively.

10. The control system of claim 9, wherein each of said first controller, second controller and third controller is adapted to compare the respective first signal differential, second signal differential and third signal differential to a predetermined differential threshold, and wherein if the  
 5 absolute value of either of the first signal differential, second signal differential and third signal differential is greater than the predetermined differential threshold, said first controller, second controller and third controller are adapted to determine a resolved sensor signal value for use by each of them using the unprocessed sensor signals, the processed sensor signal  
 10 and the sensor status signal, and wherein if the absolute value of the first signal differential, the second signal differential and the third signal differential is less than or equal to the predetermined differential threshold, each of said first controller, said second controller and said third controller is adapted to use the processed sensor signal.

11. A control system for a vehicle, comprising:  
 a plurality of input devices, each said input device operatively connected to a first sensor, a second sensor and a third sensor for sensing an input to said input device and providing in response thereto a first  
 5 unprocessed sensor signal, a second unprocessed sensor signal and a third unprocessed sensor signal;  
 a plurality of input device modules, each said input device module corresponding to one of the plurality of input devices and adapted to receive its first unprocessed sensor signal, second unprocessed

10            sensor signal and third unprocessed sensor signal and provide a  
              corresponding processed sensor signal output;  
              a first controller which is adapted to receive the first unprocessed sensor signal  
              and the processed sensor signal of each of said input devices;  
              a second controller which is adapted to receive the second unprocessed sensor  
15            signal and the processed sensor signal of each of said input devices;  
              a third controller which is adapted to receive the third unprocessed sensor  
              signal and the processed sensor signal of each of said input devices;  
              and  
              a controller bus which is operatively connected to each of said first controller,  
20            said second controller and said third controller and adapted to  
              provide signal communication between each of them.

12. The control system of claim 11, wherein each of said first  
controller, said second controller and said third controller is adapted to  
compare the processed sensor signal and the unprocessed sensor signal which  
it has received from each input device to determine a first signal differential, a  
5            second signal differential and a third signal differential, respectively, for each  
              said input device.

13. The control system of claim 12, wherein each of said first  
controller, second controller and third controller is adapted to compare the  
respective first signal differential, second signal differential and third signal  
differential of each input device to a predetermined differential threshold of  
5            that input device, and wherein if the absolute value of the first signal  
              differential, second signal differential and third signal differential of an input  
              device is greater than the predetermined differential threshold of that input  
              device, said first controller, second controller and third controller are adapted  
              to determine a resolved sensor signal value for that input device for use by  
10            each of them using the unprocessed sensor signals and the processed sensor  
              signals, and wherein if the absolute value of the first signal differential, second

signal differential and third signal differential of an input device is less than or equal to the predetermined differential threshold of that device, each of said first controller, second controller and third controller is adapted to use the  
 15 processed sensor signal of that input device.

14. The control system of claim 13, wherein said plurality of input devices is selected from a group consisting of an accelerator actuator, a brake actuator, a steering actuator, a yaw rate sensor module and a lateral acceleration sensor module.

15. The control system of claim 13, wherein said first controller, second controller and third controller are adapted to determine a resolved sensor signal using a voting process therebetween.

16. The control system of claim 11, wherein each of said input device modules is also adapted to provide a respective sensor status signal output, and wherein each of said first controller, second controller and third controller are adapted to receive the respective sensor status signals.

17. The control system of claim 16, wherein each of said first controller, second controller and third controller is adapted to compare the processed sensor signal and the unprocessed sensor signal which it has received from each input device to determine a first signal differential, a  
 5 second signal differential and a third signal differential, respectively, for each input device.

18. The control system of claim 17, wherein each of said first controller, said second controller and said third controller is adapted to compare the respective first signal differential, second signal differential and third signal differential of each input device to a predetermined differential  
 5 threshold of that input device, and wherein if the absolute value of the first

signal differential, the second signal differential and the third signal differential of an input device is greater than the predetermined differential threshold of that input device, said first controller, second controller and third controller are adapted to determine a resolved sensor signal value for that

10 input device for use by each of them using the unprocessed sensor signals, the processed sensor signals and the sensor status signals, and wherein if the absolute value of either of the first signal differential, second signal differential and third signal differential of an input device is less than or equal to the predetermined differential threshold of that device, each of said first

15 controller, second controller and third controller is adapted to use the processed sensor signal of that input device.

19. A method of determining an input command for a control system from a sensed input:

providing a first unprocessed sensor signal and a processed sensor signal which are associated with a sensed input to a first controller and

5 comparing the first unprocessed sensor signal and the processed sensor signal to obtain a first signal differential;

providing a second unprocessed sensor signal and the processed sensor signal which are associated with the sensed input to a second controller and comparing the second unprocessed sensor signal and the

10 processed sensor signal to obtain a second signal differential;

providing a third unprocessed sensor signal and a processed sensor signal which are associated with the sensed input to a third controller and comparing the third unprocessed sensor signal and the processed sensor signal to obtain a third signal differential;

15 comparing the absolute value of each of the first signal differential, second signal differential and third signal differential to a predetermined differential threshold,

if the absolute value of each of the first signal differential, second signal differential and third signal differential is less than or equal to the

20           predetermined differential threshold, using the processed sensor  
            signal in each of the first controller, second controller and third  
            controller for control based on the sensed input;  
            if the absolute value of one of the first signal differential, second signal  
            differential and third signal differential is greater than the  
25           predetermined differential threshold, determining a resolved sensor  
            signal for use in each of the first controller, second controller and  
            third controller for control based on the sensed input.

            20. The method of claim 19, wherein determining a resolved  
            signal in each of the first controller, second controller and third controller for  
            control based on the sensed input comprises voting between the first  
            controller, second controller and third controller to determine the resolved  
5           sensor signal.

            21. The method of claim 20, wherein voting between the first  
            controller, the second controller and the third controller to determine the  
            resolved sensor signal comprises:  
            determining a first representative signal in the first controller using the first  
5           unprocessed sensor signal and the processed sensor signal;  
            determining a second representative signal in the second controller using the  
            second unprocessed sensor signal and the processed sensor signal;  
            determining a third representative signal in the third controller using the third  
            unprocessed sensor signal and the processed sensor signal; and  
10           comparing the first representative signal, the second representative signal and  
            the third representative signal to determine the resolved sensor  
            signal.

            22. The method of claim 21, wherein comparing the first  
            representative signal, second representative signal and third representative  
            signal to determine the resolved sensor signal comprises:

5 comparing each of the first representative signal, the second representative  
 signal and third representative signal to one another to determine a  
 first representative differential, a second representative differential  
 and a third representative differential;  
 comparing each of the first representative differential, second representative  
 differential and third representative differential to a predetermined  
 10 representative differential threshold,  
 if the absolute value of each of the first representative differential, second  
 representative differential and third representative differential is less  
 than or equal to the predetermined representative differential  
 threshold, determining a median value of the first representative  
 15 signal, the second representative signal and third representative  
 signal for use as the resolved sensor signal;  
 if the absolute value of one of the first representative differential, second  
 representative differential and third representative differential is less  
 than or equal to the predetermined representative differential  
 20 threshold, determining a mean value of the two representative  
 signals associated with the representative differentials that are less  
 than or equal to the predetermined representative differential  
 threshold; and  
 if the absolute value of two or more of the first representative differential,  
 25 second representative differential and third representative  
 differential is greater than the predetermined representative  
 differential threshold, selecting a predetermined fault value for use  
 as the resolved sensor signal.

23. A method of determining an input command for a control  
 system from a sensed input:  
 providing a first unprocessed sensor signal, a processed sensor signal and a  
 sensor status signal which are associated with a sensed input to a  
 5 first controller and comparing the first unprocessed sensor signal



and the processed sensor signal to obtain a first signal differential,  
wherein the sensor status signal is adapted to provide a fault or-no-  
fault status indication for each of the first unprocessed sensor signal,  
second unprocessed sensor signal and the third unprocessed sensor  
10 signal;  
providing a second unprocessed sensor signal, the processed sensor signal and  
the sensor status signal which are associated with the sensed input  
to a second controller and comparing the second unprocessed sensor  
signal and the processed sensor signal to obtain a second signal  
15 differential;  
providing a third unprocessed sensor signal, the processed sensor signal and  
the sensor status signal which are associated with the sensed input  
to a third controller and comparing the third unprocessed sensor  
signal and the processed sensor signal to obtain a third signal  
20 differential;  
comparing the absolute value of each of the first signal differential, second  
signal differential and third signal differential to a predetermined  
differential threshold,  
if the absolute value of each of the first signal differential, second signal  
25 differential and third signal differential is less than or equal to the  
predetermined differential threshold, using the processed sensor  
signal in each of the first controller, second controller and third  
controller for control based on the sensed input;  
if the absolute value of at least one of the first signal differential, second signal  
30 differential and third signal differential is greater than the  
predetermined differential threshold , determining which of the first  
signal differential, second signal differential and third signal  
differential is greater than the predetermined differential threshold  
and providing a fault indication for the unprocessed sensor signal  
35 associated with that signal differential;

comparing the fault indication of the unprocessed sensor signal with the status indication of the sensor status signal of that unprocessed sensor signal;

if the fault indication of the unprocessed sensor signal and the status indication  
 40 of the sensor status signal of that unprocessed sensor signal both indicate a fault, using the processed sensor signal in each of the first controller, second controller and third controller for control based on the sensed input

if the fault indication of the unprocessed sensor signal with the status  
 45 indication of the sensor status signal of that unprocessed sensor signal do not both indicate a fault, determining a resolved sensor signal for use in each of the first controller, second controller and third controller for control based on the sensed input.

24. The method of claim 23, wherein determining a resolved  
 signal in each of the first controller, second controller and third controller for control based on the sensed input comprises voting between the first  
 controller, the second controller and the third controller to determine the  
 5 resolved sensor signal.

25. The method of claim 24, wherein voting between the first  
 controller, second controller and third controller to determine the resolved  
 sensor signal comprises:  
 determining a first representative signal in the first controller using the first  
 5 unprocessed sensor signal and the processed sensor signal;  
 determining a second representative signal in the second controller using the  
 second unprocessed sensor signal and the processed sensor signal;  
 determining a third representative signal in the third controller using the third  
 unprocessed sensor signal and the processed sensor signal; and  
 10 comparing the first representative signal, second representative signal and  
 third representative signal to determine the resolved sensor signal.

26. The method of claim 25, wherein comparing the first representative signal, the second representative signal and the third representative signal to determine the resolved sensor signal comprises:  
comparing each of the first representative signal, the second representative  
5 signal and third representative signal to one another to determine a first representative differential, a second representative differential and a third representative differential;  
comparing each of the first representative differential, second representative differential and third representative differential to a predetermined  
10 representative differential threshold,  
if the absolute value of each of the first representative differential, second representative differential and third representative differential is less than or equal to the predetermined representative differential threshold, determining a median value of the first representative  
15 signal, second representative signal and third representative signal for use as the resolved sensor signal;  
if the absolute value of one of the first representative differential, second representative differential and third representative differential is less than or equal to the predetermined representative threshold,  
20 determining a mean value of the two representative signals associated with the representative differentials that are less than or equal to the predetermined representative threshold; and  
if the absolute value of each of the first representative differential, second representative differential and third representative differential is  
25 greater than the predetermined representative differential threshold, selecting a predetermined fault value for use as the resolved sensor signal.

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